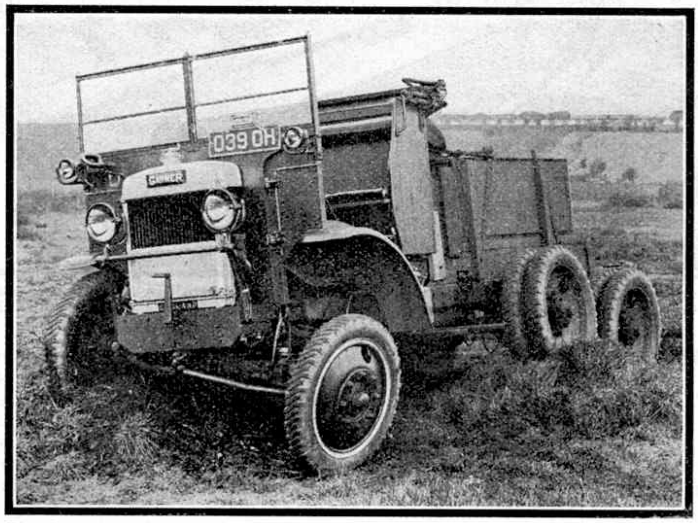
Kenneth Garner who built this fine Meccano Model.

Remarkable Six-Wheeled Chassis

A Splendid Opportunity for Model-Builders

THE severe conditions in which large-scale transport had to be carried out during the War led to a great concentration of attention upon the design of motor lorries. The result has been a rapid development in the general efficiency of such vehicles, and during the past few years many interesting types have been produced. Among the most successful of recent commercial motor vehicles is the Garner rigid six-wheeled lorry. This incorporates the many excellent qualities of the Garner vehicles of standard pattern, together with certain special features that render it useful for transport purposes over ordinary roads and the roughest ground alike.



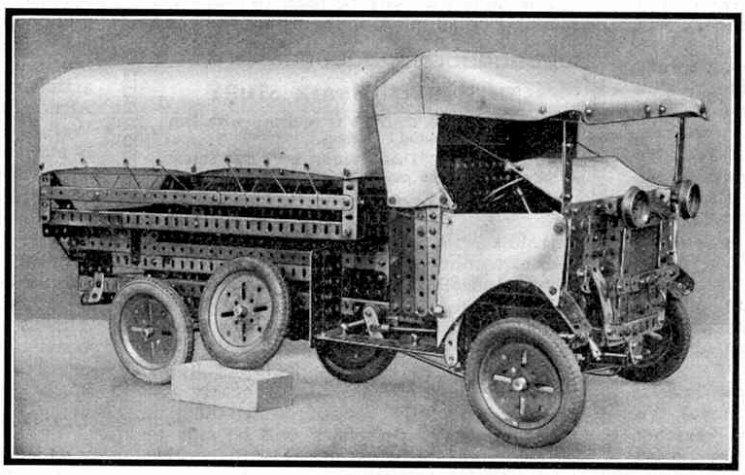
The Garner six-wheeled motor lorry. The photograph shows how the articulation of the axles enables the lorry to negotiate rough country.

A test of this Garner six-wheeler was carried out a short time ago over some of the roughest ground to be found in the British Isles, corrugated in places by ruts ranging from a foot to two feet in depth. This test showed that the chassis was capable of traversing the most uneven surface without difficulty; while in hill-climbing ability and speed on the level it surpassed many four-wheelers intended only for service on hard roads. In order to illustrate the adaptability of its wheels and axles to such unpromising conditions, the chassis was driven on low gear, in zigzag fashion, up a gradient of one in six, so that its three axles continually assumed different angles. A load of 30 cwt. was carried, and this was increased at certain points by half-a-dozen passengers. Yet in spite of this load the machine always appeared to have power in hand, and it completed the ascent with ease.

In addition to descending a hill with a gradient of one in 4¼, and demonstrating the efficiency of its brakes while travelling at high speed on the level, the vehicle gave a remarkable demonstration in a gravel quarry, in the course of which it climbed heaps of loose gravel and sand with a gradient of fully 50 per cent., and worked its way into and out of holes 4 ft. in depth. This demonstration proved the special suitability of the machine for difficult sandy surfaces.

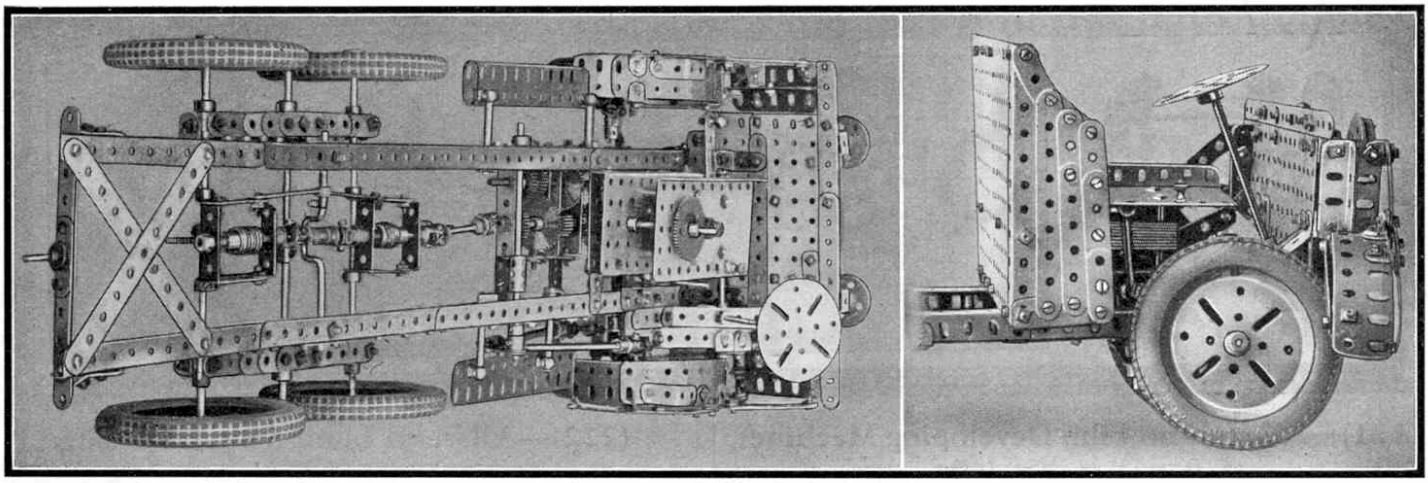
The frame length of the chassis is 15 ft. 6½ in.; the loading space behind the driver's cab is 11 ft.; and the distance between bogie axles is 3 ft. 4 in. The gear-box and clutch is incorporated with the engine unit, the whole being three-point supported in the frame. The main gear-box provides four forward speeds and reverse, but behind it is carried, on a pair of tubular cross-members, an auxiliary two-speed reducing gear-box, so that actually eight forward and two reverse speeds are available. The main shafts of the two gear-boxes are connected by a flexible disc joint to allow for any misalignment due to frame distortion.

Considerable attention has been given to the matter of effective braking. Drums are provided for all four rear wheels, and in these work shoes 17 in. in diameter with a face width of 2½ in., one set being operated by a pedal through a Dewandre servo, and the other controlled by a hand lever. The arrangement of the various controls is as follows. The main change-speed and brake levers are on the right; the auxiliary change-speed control is at the left; and, apart from the clutch and brake pedals, there is a slipper-type accelerator pedal. The ignition and throttle controls are mounted on the steering column below the wheel.



The model of the lorry built by Kenneth Garner. This splendid model incorporates all the main features of the actual vehicle, and is described in the accompanying article.

The front wheel wings are carried on a pair of vertical hinges, so that they can be swung forward to give accessibility to the engine. The hinges are designed also to permit of tilting in order to clear the wheels.



Further views of the model lorry. It is interesting to compare the photograph on the left with the chassis of the actual lorry shown below. The Garner patent front wing arrangement is well seen in the photograph on the right.

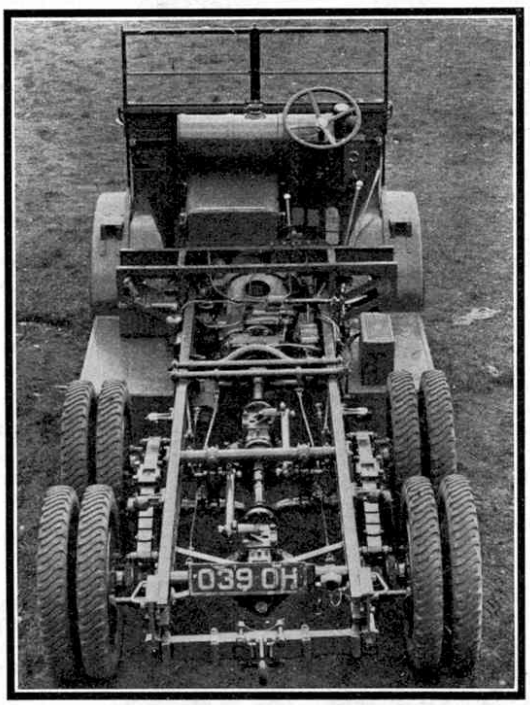
The arrangement of the back axles and suspension is on more or less orthodox lines. Between the axles the frame is joined by a pair of tubular cross-members, one above the other; and on the ends of the lower member are centrally pivoted double-inverted semi-elliptic springs on each side, their outer ends being pivoted to brackets on the axles. The two cross-tubes are joined by a pair of vertical members that form the anchorages of a pair of torque members attached to lugs cast on covers fitted to the housings of the driving shaft worms.

The bogie has two inverted semi-elliptic springs at each side, and a ball-jointed radius and torque rod stretches from the top cover of each of the driving worm casings to stout brackets connecting a tubular cross-member with the fulcrum member for the rear springs. The torque member attachments take the form of balls and sockets to afford the necessary flexibility. Excessive vertical and tilting movements of the axles are prevented by steel wire cable slings and rubber buffers held in brackets secured to the frame side members.

One of the most interesting features of the chassis is the arrangement of the front axle and springing to permit perfectly free axle movements without imposing twisting stresses on the frame. The axle is located by two long radius rods at the back, universally anchored to brackets fitted under the side frames, and joined by a tubular cross-member. These take the thrusts when the wheels meet obstacles while travelling forward. In addition, forward thrust on the axle is resisted by a third radius rod of wide V shape, secured at the centre by a ball and socket to the front end of the frame, and having its outer ends attached to the axle close to the steering pivots.

The front suspension comprises two quarter-elliptic springs, their inner ends held in a pivoted bracket, and their outer ends passing between rollers carried in brackets secured to the axle. These springs are not parallel with the axle, but are inclined forward, thus increasing their length and flexibility. It will be seen that by this arrangement both the axle and the front radius rod articulate together with the springs to the limits imposed by the slings and rubber buffers already mentioned.

The steering box, which is of the cam and lever pattern, is mounted at the extreme front of the off-side frame member. In order to obviate road shocks as much as possible, the drop arm to the steering wheel is connected by a drag link about 4 ft. in length, carried back to an idle lever pivoted to the frame, from which a second rod is taken forward to the steering arm. The vehicle will turn in a circle 47 ft. 6 in. in diameter.



The Garner lorry chassis with the body removed, showing how the transmission to the second and third axles is carried by overhead Worm drive.

The Garner chassis affords a splendid subject for reproduction in Meccano. This will be apparent from the accompanying photographs of the fine scale model constructed by Kenneth Garner, son of Mr. Garner, of Garner Motors Ltd. Construction of this model was begun during the summer of 1928, at which time the technical staff of Garner Motors Ltd. were busily engaged in drawing up plans for their new production. The greater portion of the model, namely, the frame, bogie, and articulating front axle, was developed from the original drawings of the actual chassis. The model proved very helpful to the designers in assisting them to work out the general details, as it showed quite clearly a number of movements that it was not possible to convey clearly by drawings alone. The cab and bodywork are built to scale, the measurements being based on the dimensions of actual vehicles in the Garner Works.

The model is driven by a six-volt Meccano Electric Motor, which is incorporated in the frame as a substitute for the orthodox engine. The gear-box gives two speeds forward, and reverse travelling is obtained by reversing the motor. The final drive to the second and third axles is transmitted by Worm gears. (*Continued on page 251*)

(224)—Automatic Motor Brake

(D. Garnett, Southbourne, Bournemouth)

Readers of the "Suggestions Section" will remember perhaps, that we published a suggestion for an automatic brake for the 6-volt Motor in the August, 1929, "*M.M.*", the object of which was to apply a retarding force to the armature spindle of the Motor immediately the power is cut off. A brake of this nature is very useful in hoisting machinery of all kinds.

Fig. 224 illustrates an improved form of this type of brake. The rotating member of the brake is a 1" fast Pulley shod with a 1" Dunlop Tyre and secured to the armature spindle. The fixed

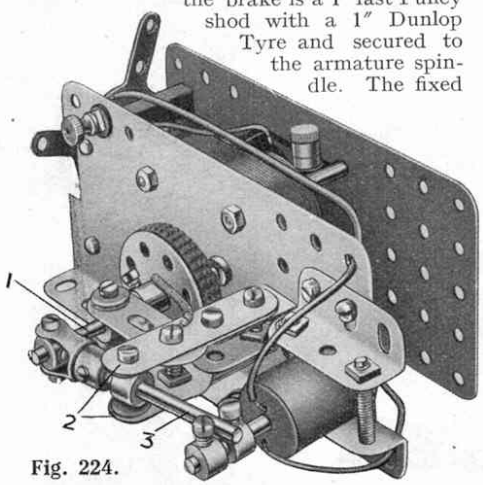


Fig. 224.

portion of the brake consists of a Bush Wheel on a Rod 1 that is free to slide in a Collar, which is fixed rigidly between the ends of a pair of Simple Bell Cranks. The latter are bolted to vertical Strips 2, which are secured to the arms of a Single Bent Strip on the Motor Plate.

A Rod 3 is mounted in a Collar that is free to turn about the Bolts retaining it in place between the Strips 2. One end of this Rod is attached pivotally by a Swivel Bearing to the Rod 1, whilst its other end is connected as indicated to the end of the solenoid plunger. The Bush Wheel is normally kept in contact with the tyre-shod Pulley by means of a small piece of Spring Cord, which is bolted to the Strip 2 and presses on to the Bush Wheel. A similar piece of Spring Cord should be attached to the other side (the underneath) of the model.

The solenoid is composed of a Bobbin wound with four layers of No. 23 SCC wire. One of the wires is attached to a terminal, which is insulated from the Motor Side Plate by an Insulating Bush and a Washer, and the other wire is bolted in metallic contact with the plate. One of the Motor terminals is treated in a similar manner. Connection is made to the Accumulator from the terminal on the Motor side plate and the remaining Motor terminal.

When the Motor is running, current is flowing through the turns of the solenoid, which keeps the plunger down, and consequently the brake is held off. When the current is cut off, the solenoid is de-energised and frees the plunger, thus allowing the face of the Bush Wheel to come into contact with the Tyre on the 1" fast Pulley.

In order that the device may function efficiently all moving parts should be carefully adjusted so that freedom of movement is assured.

(225)—Automatic Steering Gear for Model Yachts

(B. Redhead, Lincoln)

Those who are the fortunate owners of model racing yachts will be keenly interested in the working model of Braine's automatic steering gear shown in Fig. 225. The object of the device is to keep the model boat on a straight, predetermined course. In the case of a boat fitted with an ordinary tiller, a straight course is exceedingly difficult to maintain, for a sudden gust of wind may strike the boat and cause her to "pay off." She may, of course, return to her original course, but the chances are that she will proceed in an entirely different direction. Careful trimming of the sails and adjustment of the helm is of little avail, since although these may be correct for a given strength and direction of wind, a wayward gust may upset all the model yachtman's careful calculations. The Braine automatic steering gear surmounts these obstacles in a way that will be clear from a little study of the Meccano model. For practical application of the gear, the model would, of course, be modified considerably. For instance, there would be no necessity for the metal base plates, and the main boom and mast of the yacht would take the place of the Meccano Rods that represent these parts in the illustration.

The tiller 1 is secured to the upper end of the rudder stock and in shape resembles the letter T. Each end of the top of the T is connected by crossed cords to the main boom at the point 3. The other end of the tiller moves under a yoke and its extremity has fixed to it a short length of Spring Cord 2. The other end of the spring may be anchored in various positions in the base plate to alter its tension.

When the boat is running "close hauled," that is, sailing close in to the wind, the main boom is pulled inboard as far as possible by sliding the Collar 3 towards the end of the boom. Under these conditions if the boat's head tends to "pay off," the boom swings outward, thus angling the rudder through the medium of the cords attached to the tiller, and returning the boat to her original course.

The setting of the mainsail is accomplished by sliding the Collar 3 on the boom, moving it towards the mast when the boat is sailing before the wind with the boom swung outboard, and sliding it in the reverse direction when it is desired to set her on a close hauled course.

The most critical adjustment of the device lies in the correct tensioning of the Spring 2 for various courses and wind strengths. A little practice, however, will soon enable the model yachtsman to adjust matters so that, unless something abnormal occurs, his craft will keep on a straight course. In some cases the gear may prove more sensitive and reliable if a length of thin elastic be substituted for the Spring Cord 2.

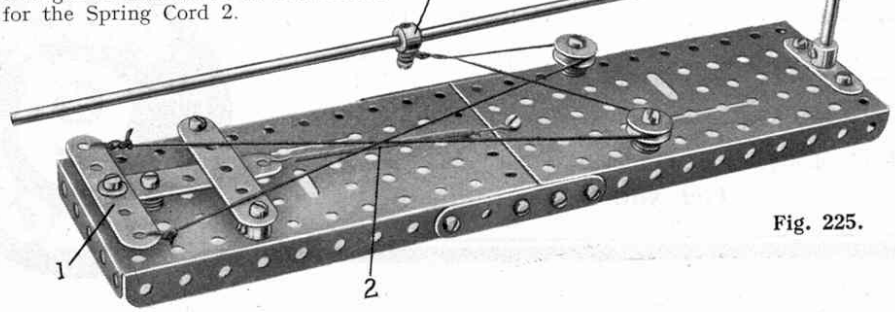


Fig. 225.

Miscellaneous Suggestions

Under this heading "Spanner" replies to readers who submit interesting suggestions regarding new Meccano models or movements that he is unable to deal with more fully elsewhere. On occasion he offers comments and technical criticisms that, he trusts, will be accepted in the same spirit of mutual help in which they are advanced.

(M.108). A Neat Wheel for Double Tyres.—Eric Skinner (Anerley) points out that a novel motor lorry wheel may be built up from a typewriter ribbon spool. Two 2" Dunlop Tyres may be mounted side by side on the periphery of the spool, and it will be found that the central hole through the spool is a running fit on the standard size of Meccano Rod. We have built up a wheel in the manner suggested, and we can vouch for its realistic appearance, and the way in which it enhances the appearance of a model lorry.

(M.109). An Automatic Switch.—Many Meccano boys must have had the annoying experience of groping around in a semi-dark cupboard trying to find a solitary nut or grub-screw! In order to make such a search easier, S. Wild (Ashton-under-Lyme) suggests the fitting of a device that switches on a light when the door is opened. The switch is arranged in the following manner. A $3\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip is secured by a wood screw near the top of the door, on the inside and close to the hinge. The Double Angle Strip is bent upward slightly until it comes into contact (when the door is opened) with an Angle Bracket or similar part, fixed to the top frame of the door so that it coincides with the lower edge of the frame. One wire from the battery is taken to one contact of the switch, while from the other contact a wire is attached to one side of the lamp. It only remains to connect the lamp with the battery.

(M.110). Safety Device for Trailers.—For trailers that are hauled by a clockwork tractor, O. Beatton (Port Glasgow) suggests a way in which the tractor may be pulled up in the event of the trailer breaking away. The device is very simple, for it consists in connecting the trailer by a length of cord to the brake lever of the Motor, so that when the trailer breaks away, the lever is pulled down and the tractor is brought to rest.

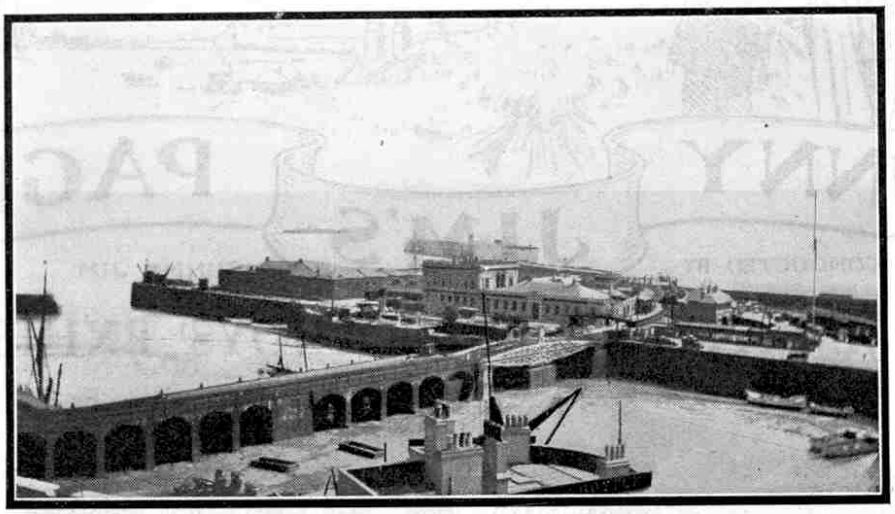
(M.111). "Making Old Bolts New."—That the heads of old-style bolts may be rounded like the latest type in a Meccano lathe is the suggestion of J. Wahl (Johannesburg, S. Africa). The lathe is quite a simple affair, for it consists essentially of a Coupling secured on the end of a rotating Rod. The shank of the bolt is held in the Coupling and the head can be shaped with the aid of a file as the bolt is turning. Unfortunately, this process removes the lacquer, a fact that soon causes the heads of the bolts to become tarnished.

Powerful Searchlight—*(Continued from page 211)*

case of a battleship in action the searchlight is likely to come in for rough usage and a great deal of thought has been given to the problem of producing the most robust mechanism possible. A modern battleship searchlight is not only capable of withstanding the heavy vibration of gunfire, but even if hit by a shell the mirror is merely fractured and the efficiency of the beam is not seriously affected.

Another interesting type of searchlight is that used for the navigation of the Suez Canal. This gives a split beam with a dark space between. In this manner the sides of the canal are illuminated, but the light is not thrown upon oncoming vessels, so that pilots are not blinded by the glare. Searchlights are also used in fire brigade work for lighting when the usual sources of illumination have been extinguished.

A Famous Harbour



View of Folkestone Harbour, showing the swing bridge that carries the railway to the harbour station. The bridge is 270 tons in weight, of which the swinging section accounts for 260 tons. It is supported on a central pier and the moving portion runs on roller bearings. The bridge is about 132 ft. in overall length and when open leaves two channels into the Old Harbour each 50 ft. in width.

Six-Wheeled Chassis—*(Continued from page 225)*

Steering is by means of Ackermann type linkage, and the change-speed lever for the gear-box is placed at the driver's left-hand side. The special Garner front wheel articulation system is faithfully reproduced in the model, and it is interesting to note that, by incorporating two quarter-elliptical springs arranged in V formation and working in combination with a radius rod, a considerable difference in front wheel level is possible. The springs are centrally pivoted to the chassis and give free articulation of the front wheels within a limit of 1½ in.

The rear axle suspension consists of two inverted semi-elliptical springs built up from Strips of various lengths on each side of the frame; and these also incorporate the bogie mounting system. An important feature of this method of suspension is that the front wheels are mounted in practically the same position fore and aft as when the usual semi-elliptical spring system is provided; thereby reducing the total length of the chassis and wheelbase without reducing the available loading space. The body is of the "well" type, and is equipped with small hooks, to which a canvas covering may be attached. A hinged tailboard also is provided.

The model chassis is 2 ft. in length overall and 8 in. in width, the track width being 7 in. The overall measurements of the body are length 15½ in., width 8 in., and height 8 in.

Every part of the chassis consists of standard Meccano parts. The transmission incorporates several Universal Couplings in order to provide flexibility of the inner bogie axle for travelling over uneven ground. The six road wheels consist of 3 in. Pulleys fitted with 3 in. Meccano Dunlop Tyres, and these give to the model a very finished and realistic appearance.

There is no doubt that many readers will wish to construct for themselves a model chassis of a similar type. In order to encourage originality in this class of model-building, we have decided to offer prizes of £1-1s. for the best model of an articulated six-wheeled vehicle, of a similar type to the Garner lorry, submitted by Home and Overseas readers respectively. Prizes of 10/6 and 5/– respectively will be awarded to the two models that come next in order of merit in each Section, and in addition several Meccano Engineer's Pocket Books will be awarded in recognition of other good models.

Competitors should note that actual models must not be sent. All that is required is a photograph and a brief description of the design and construction of the most important features of the model.

The age, name and address of the competitor must be written clearly on the back of all photographs or sheets of descriptive matter submitted, and the envelopes should be addressed: "Garner Chassis Competition," Meccano Ltd., Old Swan, Liverpool. The entries from Home readers must reach headquarters not later than 30th May, 1931, and those from Overseas readers not later than 31st July, 1931.

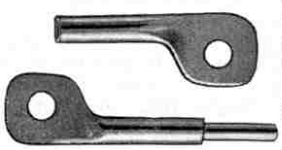
It should be noted that photographs of the prize-winning models become the property of Meccano Ltd., but photographs of unsuccessful entries will be returned to the senders if desired, providing that a stamped addressed envelope of the necessary size is enclosed with the entry.

New Meccano Part

No. 173 Rail Adaptor, per pair 6d.

This new unit has been designed to enable Hornby Rails to be connected to rails built up from Meccano parts, such as Strips, Angle Girders, etc.

As shown in the accompanying illustration the Adaptor consists of a pair of connecting pieces, one fitted with a pin that is inserted in the socket of a standard Hornby Rail, and the other provided with a socket to take the projecting pin on the Hornby Rail. The connecting pieces are fitted with perforated lugs that are pushed over the ends of the Strips or Girders forming the Meccano rails, and secured to them by means of bolts so that a rigid connection is made.



The Adaptor will be found very useful by constructors who have a supply of Meccano Strips, etc., and also of Hornby Rails, as they will now be able to employ both materials in the construction of track for Hornby locomotives or Meccano models.